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(54) **LIM WEIGHT SORTER**

LIM-SORTIERER NACH GEWICHT

DISPOSITIF DE TRI PAR POIDS

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(73) Proprietor: **Laitram, LLC**
Harahan, LA 70123 (US)

(72) Inventor: **RAGAN, Bryant G.**
Metairie, Louisiana 70001 (US)

(74) Representative: **Forresters IP LLP**
Skygarden
Erika-Mann-Straße 11
80636 München (DE)

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Description

BACKGROUND

[0001] The invention relates generally to power-driven conveyors and more particularly to conveyor belts with electromagnetically activated, article-supporting rollers diverting conveyed articles from the main conveying direction.

[0002] Many production operations use weight measurements for quality control. For example, a beverage-packing facility may weigh packed cases of multiple cans to ensure that cases with leaking or improperly filled cans are rejected and removed from the production line. Checkweighers consisting of a section of conveyor belt on a weigh scale are often used to weigh cases. Positioned in the production line, the checkweigher can weigh only one case at a time. Consecutive cases have to be separated by a gap or stopped from entering the checkweigher belt when another case is being weighed. And many checkweighers require the cases to be stopped for an accurate measurement. Starting and stopping the conveyors and gapping cases slows production.

[0003] WO 2013/169343 discloses conveyor rollers rotated by electromagnetic induction to propel articles conveyed atop the rollers according to the preamble of claim 1.

SUMMARY

[0004] In a first aspect of the present invention there is provided a conveyor set forth in claim 1.

[0005] In another aspect of the present invention there is provided a method of conveying objects set forth in claim 12.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006]

- FIG. 1 is an isometric view of a portion of a sorter embodying features of the invention;
- FIGS. 2A-2D depict the sequence of diverting or conforming articles to a side of the sorter of FIG. 1;
- FIGS. 3A-3D depict the sequence of diverting a lighter, non-conforming article off a side of the sorter of FIG. 1;
- FIG. 4 depicts graphs of the acceleration, velocity, and lateral displacement as a function of time for a conveyed article on the sorter of FIG. 1;
- FIG. 5 is a plot of the trajectories of light and heavy articles conveyed on a sorter as in FIG. 1;
- FIGS. 6A and 6B depict two sequential isometric views of the sorter of FIG. 1 with a sensor used to measure lateral displacement of a conveyed article; and
- FIGS. 7A-7D depict sequential isometric views of a sorter as in FIG. 1 with multiple roller-actuation zones.

DETAILED DESCRIPTION

[0007] A portion of a weighing and sorting conveyor embodying features of the invention is shown in FIG. 1. The conveyor 10 comprises a conveyor belt 12 having rows of rollers 14 rotatable on axes of rotation 16. In this example the axes of rotation 16 are parallel to a direction of belt travel 18 so that the rollers 14, at their apexes, rotate in a lateral direction 20 perpendicular to the direction of belt travel 18. The rollers could alternatively be arranged with their axes oblique to the direction of belt travel 18. In that case the rollers would rotate in a direction transverse, although not perpendicular, to the direction of belt travel 18. In the rest of this description, the rollers 14 are shown rotating in a lateral direction 20 perpendicular to the direction of belt travel.

[0008] The exemplary conveyor belt 12 shown in FIG. 1 is a modular plastic conveyor belt constructed of rows 22 of belt modules linked together at hinge joints 24 and driven continuously by motor-driven drive sprockets or drums (not shown) in the direction of belt travel 18 along an upper carryway path 26. The rollers 14 are cylindrical rollers that are made of an electrically conductive material, such as aluminum or copper, or that contain elements made of such a material. For a better grip on conveyed objects, the rollers 14 have a high-friction outer surface, textured or coated with a high-friction material such as rubber, an elastomer, or other resilient material.

[0009] A linear-motor stator 30 is situated proximate the conveyor belt 14 along a portion of the carryway 26. In this example the stator 30 lies under the conveyor belt 14 along a portion of the carryway 26 between the carryway and a lower returnway (not shown). The stator 30 is arranged to produce an electromagnetic flux wave that travels across the stator perpendicular to the axes 16 of the rollers 14 and across the width of the conveyor belt 12 in that portion of the belt directly above the stator. The traveling flux wave induces eddy currents in the electrically conductive material of the rollers 14. The currents produce a reaction magnetic field that interacts with the stator flux wave to cause a constant torque in the rollers 14, which act as rotors to the stator 30 in a linear-induction motor, or LIM. The torque causes the rollers to rotate in the lateral direction 20 at their apexes. The dimensions of the stator 30 define the extent of a roller-activation zone 32 that extends across the width of the carryway 26 from an entrance end 34 of the zone to an exit end 35 downstream. According to the invention, the sorting conveyor also includes a side-off conveyor 36 such as a belt conveyor, a roller conveyor, or a chute, receiving objects diverted off a side 38 of the belt 12 by the rollers 14 activated as they pass through the roller-activation zone 32. According to the invention, a side rail 40 downstream of the side-off conveyor 36 prevents objects from exiting the side 38 of the belt 12 immediately downstream of the side-off conveyor 36.

[0010] The operation of the LIM-activated sorter 10 in a weight-based quality control conveyor system is shown in FIGS. 2A-2D. In FIG. 2A an object, in this example a filled box B, is shown entering the roller-activation zone 32 above the linear-motor stator 30. The rollers 14 passing through the activation zone 32 on the conveyor belt 12 are rotated in the lateral direction 20 by the stator's flux wave. Because the torque of the rollers 14 generated by the LIM stator 30 is generally constant, the acceleration of the rollers is also constant and inversely proportional to the weight of the box B atop the rollers 14. The rollers 14 rotate faster and faster as they proceed with the belt 12 through the activation zone 32. The rollers 14 accelerate the box B in the lateral direction 20 through the roller activation zone and push it toward the side 38 as shown in FIG. 2B. Upon exiting the roller-activation zone 32, the rollers supporting the box B reach a final speed v_f at which they continue to coast, without further acceleration, downstream of the exit end 35 of the zone, as shown in FIG. 2C, until the box contacts the side rail 40 in FIG. 2D. So the rate of lateral displacement of the box B increases in the roller activation zone 32 and remains constant downstream where the rollers 14, no longer activated, are allowed to coast.

[0011] FIGS. 3A-3D depict the operation of the weight sorter 10 with a non-conforming underweight box B'. The motion of the underweight box B' in FIGS. 3A-3D differs from that of the heavier box B in FIGS. 2A-2D in that it travels faster laterally. That's because the acceleration of the rollers and the lateral acceleration of the box are inversely proportional to the box's weight. So the lighter box B' reaches the side 38 of the belt 12 at a position upstream of where the heavier box B in FIG. 2D reaches the side rail 40. The side-off conveyor 36 upstream of the rail 40 receives the rejected underweight box B' sorted off the belt 12. In the sorters shown in FIGS. 2A-D and 3A-D, the boxes B, B' would normally enter activation zone 32 at a specific lateral position, such as registered along the side 39 of the belt 12 opposite the side-off conveyor 36.

[0012] Graphs of the equations of motion of objects conveyed atop the rollers are shown in FIG. 4. The time t_f represents the time, measured from time t = 0, during which the object is passing through the roller-actuation zone. That time period t_f depends on the speed of the conveyor belt and the length of the activation zone along the carryway. In that time t_f, the object is subjected to a constant acceleration *a,* as indicated by the bottom graph. The amplitude of the acceleration *a* is inversely proportional to the object's weight. During that time the lateral speed *v* of the object and of the rollers supporting the object increases linearly with time *t,* as shown by the middle graph. The lateral displacement *x* of the object increases with the square of the time variable *t*. Once the object exits the end of the roller-actuation zone, i.e., for $t > t_f$, the acceleration drops to zero and the object coasts laterally at a constant speed v_f. The object's lateral displacement *x* downstream of the roller-actuation zone increases linearly with time *t*. The graphs of FIG. 4 depict the ideal case in which the torque is constant on all the loaded rollers, the friction of the roller bearings is insignificant, and the objects don't slip on the outer surfaces of the rollers. Because the acceleration of a heavier object is less than that of a lighter object, the speed v_f the object reaches upon exiting the roller-actuation zone is less for the heavier object. And like the acceleration, that speed v_f is inversely proportional to the object's weight. Likewise, the lateral displacement *x* is inversely proportional to the object's weight and so a lighter object travels a greater lateral distance in the same time as a heavier object. So the weight of an object can be determined from its final speed v_f, its displacement x, or its acceleration *a.*

[0013] The trajectories of heavy and light objects along the carryway of a conveyor as in FIGS. 1-3 is shown in FIG. 5, which is an overhead view of the trajectories of objects on a conveyor belt advancing in the direction of belt travel 18. Lateral displacement is given by the horizontal axis *x;* displacement in the direction of belt travel is given by the vertical axis *y*. The belt is considered to advance in the direction of belt travel at a constant speed. The roller-activation zone's entrance end 34 coincides with the x axis. The exit end 35 is indicated by the dashed line. The solid-line trajectory 42 represents the trajectory of a heavy object. The dashed-line trajectory 44 represents the trajectory of a light object. The horizontal distance d between the two trajectories 42, 44, representing the difference between their lateral displacements *x,* at a given distance y_m from the entrance end 34 of the roller-actuation zone is a measure of the difference in the weights of the heavy and light objects. In the roller-activation zone the objects follow a parabolic trajectory, for which $x \propto y^2$. Downstream of the roller-activation zone, the trajectories are linear and $x \propto y$. Because the trajectories show the lateral displacement *x* at any measurement position y_m along the carryway path, the weight of an object can be determined from its trajectory.

[0014] FIGS. 6A and 6B show a non-stop checkweigher 46 comprising a stator 30 forming a roller-activation zone 32 through which a roller-top conveyor belt 12 advances continuously. A sensor 48, such as a laser range finder or any sensor system whose output can be used to determine the lateral displacement, lateral speed, or lateral acceleration of a box B, is shown positioned at the side of the conveyor belt 12. The stator 30 causes the rollers to rotate and push the box B in the lateral direction 20 as the conveyor belt 12 advances in the direction of belt travel 18 through the roller-activation zone 32. From the box's lateral motion as it advances through the roller-activation zone 32, the output 50 of the sensor 48 can be used to determine the box's weight from its lateral acceleration, speed, or displacement in moving from one side of the belt 12 to the other as shown by the progression from FIG. 6A to FIG. 6B.

[0015] The weighing and sorting functions can be combined as shown in the system of FIGS. 7A-7D. The weighing and sorting system 52 uses a first stator 30 in an upstream roller-activation zone 32 with a sensor 48, as in FIGS. 6A-6B, to determine the weight of the box B and move it in the lateral direction 20 as the conveyor belt 12 advances in the direction of belt travel 18. The weighing function is shown in the sequence from FIG. 7A to FIG. 7B. In FIGS. 7C and 7D the box is sorted off the side 38 of the belt 12 in the lateral direction 20 and onto a discharge conveyor 36 by activated belt rollers 14 passing through a downstream roller-activation zone 32' formed by a downstream stator 30'. Heavier boxes not moved far enough in the lateral direction 20 to be sorted off onto the discharge conveyor 36 would continue down the conveying line for further processing.

[0016] Although the invention has been described in detail with respect to a few preferred versions, other versions are possible. For example, the sensor used could be a visioning system that computes the objects' weights from the lateral acceleration, speed, or displacement derived from the objects' trajectories. In all the versions described, the conveyed objects ride directly on belt rollers that include electrically conductive material to act as the rotors of linear-induction motors. But the electrically conductive belt rollers do not have to contact the conveyed objects directly. Instead, the electrically conductive rollers could be used to drive one or more object-supporting belt rollers to move the objects laterally across the belt. And a series of roller-activation zones formed by a series of stators along the carryway could be used to sort objects of different weights off the side of the belt at a number of discharge points at spaced apart positions along the carryway with the lighter objects sorted off upstream of the heavier objects. So, as these few examples suggest, the scope of claims is not meant to be limited to the details of the exemplary versions used to describe the invention.

Claims

1. A conveyor (10) comprising:

a conveyor belt (12) advancing along a carryway path (26) in a direction of belt travel (18), the conveyor belt (12) having a plurality of rollers (14) rotatable in a lateral direction (20) transverse to the direction of belt travel (18);
a linear stator (30) adjacent to the conveyor belt (12) in a roller-activation zone (32) extending along the carryway path (26) from a zone entrance (34) to a zone exit (35);
wherein each of the rollers (14), acting as a rotor, forms with the linear stator (30) a constant-torque linear-induction motor that rotates the rollers (14) in the lateral direction in the roller-activation zone (32) so that objects (B) conveyed on the conveyor belt (12) are propelled by the rotation of the rollers (14) to exit the roller-activation zone (32) with a speed parallel to the lateral direction that is inversely proportional to the weights of the objects (B):

characterised in that the conveyor (10) further comprises a side-off conveyor (36) for receiving objects (B) diverted off a side of the conveyor belt (12); and
a side rail (40) downstream of the side-off conveyor (36), to prevent objects from exiting the side (38) of the belt (12) immediately downstream of the side-off conveyor (36).

2. A conveyor as in claim 1 further comprising a sensor (48) making measurements of the lateral acceleration, speed, or displacement of the conveyed objects (B) at a sensor position along the carryway (26) downstream of the zone entrance (34) of the roller-activation zone (32) for conversion of the measurements into object weights.

3. A conveyor as in claim 1 wherein the rollers (14) are deactivated and allowed to coast upon exiting the roller-activation zone (32).

4. A conveyor as in claim 1 further comprising one or more discharge points (36) at spaced apart positions along the carryway (26) at which objects transfer off a side of the conveyor, wherein the objects are sorted according to their weights.

5. A conveyor as in claim 4 comprising two or more discharge points and wherein the lighter objects are sorted off upstream of the heavier objects.

6. A conveyor as in claim 1 comprising a series of linear stators (30) defining a series of roller- activation zones (32, 32') along the carryway (26).

7. A conveyor as in claim 1 wherein the rollers (14) are in direct contact with the conveyed objects (B).

8. A conveyor as in claim 1 wherein the conveyor belt (12) further has object-supporting rollers rotated by the rotating rollers.

9. A conveyor as in claim 1 wherein the lateral direction (20) is perpendicular to the direction of belt travel (18).

10. A conveyor as in claim 1, wherein:

the linear-motor stator (30) produces a traveling magnetic flux wave that travels in the lateral direction in the roller-activation zone (32) ;
the rollers (14) include electrically conductive material in which eddy currents are induced by the traveling magnetic flux wave as the rollers (14) pass through the roller-activation zone (32), the eddy currents producing a reaction electro-

magnetic field that interacts with the traveling magnetic flux wave to produce a torque in the rollers (14) that causes the rollers (14) to rotate in the lateral direction (20);
the torque is constant enough to cause the roller-activation zone (32) to accelerate with a constant enough angular acceleration to move objects (B) conveyed on the belt parallel to the lateral direction (20); and
the lateral accelerations and displacements of the conveyed objects (B) are inversely proportional to the conveyed objects' weights.

11. A conveyor as in claim 1 wherein the rollers (14) rotate in the lateral direction (20) at a constant speed upon exiting the roller-actuation zone (32).

12. A method for conveying objects (B), comprising: conveying objects (B) atop rollers (14) on a conveyor belt (12) advancing in a direction of belt travel (18); activating the rollers (14) passing through a roller-activation zone (32) by linear induction to rotate in a direction (20) transverse to the direction of belt travel (18) to cause each object (B) to move along a trajectory that depends on the object's weight to a side-off conveyor (36) at a side of the conveyor belt (12); and preventing the objects (B) from exiting the side of the conveyor belt (12) immediately downstream of the side-off conveyor (36) with a side rail (40).

13. The method of claim 12 further comprising determining the weight of each object from its trajectory.

14. The method of claim 12 further comprising sorting objects off a side of the conveyor belt by weight with lighter objects sorted off upstream of heavier objects.

Patentansprüche

1. Fördervorrichtung (10), umfassend:

ein Förderband (12), das sich entlang einem Transportpfad (26) in einer Bandlaufrichtung (18) vorwärts bewegt, wobei das Förderband (12) mehrere Rollen (14) aufweist, die in einer lateralen Richtung (20) drehbar sind, die quer zur Bandlaufrichtung (18) ist;
einen Linearstator (30), der an das Förderband (12) in einer Rollenaktivierungszone (32) angrenzt und sich entlang dem Transportpfad (26) von einem Zoneneintritt (34) zu einem Zonenaustritt (35) erstreckt;
wobei jede der Rollen (14), die als ein Rotor fungieren, mit dem Linearstator (30) einen Linearinduktionsmotor mit konstantem Drehmoment bildet, der die Rollen (14) in der lateralen Richtung in der Rollenaktivierungszone (32) bildet, so dass Gegenstände (B), die auf dem Förderband (12) befördert werden, durch die Drehung der Rollen (14) vorwärts getrieben werden, um aus der Rollenaktivierungszone (32) mit einer Geschwindigkeit parallel zu der lateralen Richtung auszutreten, die umgekehrt proportional zu den Gewichten der Gegenstände (B) ist:

dadurch gekennzeichnet, dass die Fördervorrichtung (10) weiterhin eine Seitenabgangsfördervorrichtung (36) zum Aufnehmen von Gegenständen (B) umfasst, die von einer Seite des Förderbands (12) abgeleitet werden; und
eine Seitenschiene (40), die stromabwärts von der Seitenabgangsfördervorrichtung (36) ist, um zu verhindern, dass Gegenstände von der Seite (38) des Bands (12) unmittelbar stromabwärts von der Seitenabgangsfördervorrichtung (36) austreten.

2. Fördervorrichtung nach Anspruch 1, weiterhin umfassend einen Sensor (48), um Messungen der lateralen Beschleunigung, Geschwindigkeit oder Verlagerung der beförderten Gegenstände (B) an einer Sensorposition entlang dem Transportweg (26) stromabwärts von dem Zoneneintritt (34) der Rollenaktivierungszone (32) zur Umwandlung der Messungen in Gegenstandsgewichte vorzunehmen.

3. Fördervorrichtung nach Anspruch 1, wobei die Rollen (14) bei Austreten aus der Rollenaktivierungszone (32) deaktiviert und ausrollen gelassen werden.

4. Fördervorrichtung nach Anspruch 1, weiterhin umfassend einen oder mehrere Entladepunkte (36) in voneinander beabstandeten Positionen entlang dem Transportweg (26), an denen Gegenstände von einer Seite der Fördervorrichtung abgeleitet werden, wobei die Gegenstände gemäß ihren Gewichten sortiert werden.

5. Fördervorrichtung nach Anspruch 4, umfassend zwei oder mehr Entladepunkte, und wobei die leichteren Gegenstände stromaufwärts von den schwereren Gegenständen weg sortiert werden.

6. Fördervorrichtung nach Anspruch 1, umfassend eine Reihe von Linearstatoren (30), die eine Reihe von Rollenaktivierungszonen (32, 32') entlang dem Transportweg (26) definieren.

7. Fördervorrichtung nach Anspruch 1, wobei die Rollen (14) in direktem Kontakt mit den beförderten Gegenständen (B) sind.

8. Fördervorrichtung nach Anspruch 1, wobei das Förderband (12) weiterhin gegenstandstragende Rollen aufweist, die von den sich drehenden Rollen gedreht werden.

9. Fördervorrichtung nach Anspruch 1, wobei die laterale Richtung (20) senkrecht zu der Bandlaufrichtung (18) ist.

10. Fördervorrichtung nach Anspruch 1, wobei:

der Linearmotorstator (30) eine wandernde Magnetflusswelle produziert, die in der lateralen Richtung in der Rollenaktivierungszone (32) wandert;
die Rollen (14) elektrisch leitendes Material beinhalten, in denen Wirbelströme von der wandernden Magnetflusswelle induziert werden, während die Rollen (14) durch die Rollenaktivierungszone (32) laufen, wobei die Wirbelströme ein elektromagnetisches Reaktionsfeld produzieren, das mit der wandernden Magnetflusswelle wechselwirkt, um ein Drehmoment in den Rollen (14) zu produzieren, das bewirkt, dass die Rollen (14) sich in der lateralen Richtung (20) drehen;
das Drehmoment konstant genug ist, um zu bewirken, dass die Rollenaktivierungszone (32) mit einer Winkelbeschleunigung, die konstant genug ist, beschleunigt, um Gegenstände (B), die auf dem Band befördert werden, parallel zu der lateralen Richtung (20) zu bewegen; und
die lateralen Beschleunigungen und Verlagerungen der beförderten Gegenstände (B) umgekehrt proportional zu den Gewichten der beförderten Gegenstände sind.

11. Fördervorrichtung nach Anspruch 1, wobei die Rollen (14) sich bei Austreten aus der Rollenaktivierungszone (32) in der lateralen Richtung (20) mit einer konstanten Geschwindigkeit drehen.

12. Verfahren zur Beförderung von Gegenständen (B), umfassend:
Befördern von Gegenständen (B) auf Rollen (14) auf einem Förderband (12), das sich in einer Bandlaufrichtung (18) vorwärts bewegt; Aktivieren der Rollen (14), die durch eine Rollenaktivierungszone (32) laufen, durch Linearinduktion, um sich in einer Richtung (20) quer zu der Bandlaufrichtung (18) zu drehen, um zu bewirken, dass sich jeder Gegenstand (B) entlang einer Bahn, die von dem Gewicht des Gegenstands abhängt, zu einer Seitenabgangsfördervorrichtung (36) an einer Seite des Förderbands (12) bewegt; und Verhindern, dass die Gegenstände (B) von der Seite des Förderbands (12) unmittelbar stromabwärts von der Seitenabgangsfördervorrichtung (36) austreten, mit einer Seitenschiene (40).

13. Verfahren nach Anspruch 12, weiterhin umfassend ein Bestimmen des Gewichts jedes Gegenstands aus seiner Bahn.

14. Verfahren nach Anspruch 12, weiterhin umfassend ein Sortieren von Gegenständen von einer Seite des Förderbands anhand des Gewichts, wobei leichtere Gegenstände stromaufwärts von schwereren Gegenständen weg sortiert werden.

Revendications

1. Convoyeur (10) comprenant :

une bande transporteuse (12) avançant le long d'un chemin de transport (26) dans une direction de déplacement de la bande (18),
la bande transporteuse (12) comportant une pluralité de rouleaux (14) pouvant tourner dans une direction latérale (20) transversale à la direction de déplacement de la bande (18) ;
un stator linéaire (30) adjacent à la courroie transporteuse (12) dans une zone d'activation des rouleaux (32) s'étendant le long du chemin de transport (26) d'une entrée de zone (34) à une sortie de zone (35) ;
dans lequel chacun des rouleaux (14), agissant comme un rotor, forme avec le stator linéaire (30) un moteur à induction linéaire à couple constant qui fait tourner les rouleaux (14) dans la direction latérale dans la zone d'activation des rouleaux (32) de sorte que les objets (B) transportés sur la bande transporteuse (12) sont propulsés par la rotation des rouleaux (14) pour sortir de la zone d'activation des rouleaux (32) avec une vitesse parallèle à la direction latérale qui est inversement proportionnelle au poids des objets (B) :

caractérisé en ce que le convoyeur (10) comprend en outre un convoyeur latéral (36) pour recevoir les objets (B) déviés d'un côté de la bande transporteuse (12)
un rail latéral (40) en aval du convoyeur latéral (36), pour empêcher les objets de sortir par le côté (38) de la bande (12) immédiatement en aval du convoyeur latéral (36).

2. Convoyeur selon la revendication 1, comprenant en outre un capteur (48) effectuant des mesures de l'accélération latérale, de la vitesse ou du déplacement des objets transportés (B) à une position de capteur le long du chemin de transport (26) en aval de l'entrée de zone (34) de la zone d'activation des rouleaux (32) pour la conversion des mesures en poids des objets.

3. Convoyeur selon la revendication 1, dans lequel les rouleaux (14) sont désactivés et autorisés à se déplacer en roue libre à la sortie de la zone d'activation des rouleaux (32).

4. Convoyeur selon la revendication 1, comprenant en outre un ou plusieurs points de décharge (36) à des positions espacées le long du chemin de transport (26), auxquels des objets sont transférés d'un côté du convoyeur, dans lequel les objets sont triés en fonction de leur poids.

5. Convoyeur selon la revendication 4, comprenant deux ou plusieurs points de déchargement et dans lequel les objets les plus légers sont triés en amont des objets les plus lourds.

6. Convoyeur selon la revendication 1, comprenant une série de stators linéaires (30) définissant une série de zones d'activation de rouleaux (32, 32') le long du chemin de transport (26).

7. Convoyeur selon la revendication 1, dans lequel les rouleaux (14) sont en contact direct avec les objets transportés (B).

8. Convoyeur selon la revendication 1, dans lequel la bande transporteuse (12) comporte en outre des rouleaux de support d'objets mis en rotation par les rouleaux rotatifs.

9. Convoyeur selon la revendication 1, dans lequel la direction latérale (20) est perpendiculaire à la direction de déplacement de la bande (18).

10. Convoyeur selon la revendication 1, dans lequel :

le stator du moteur linéaire (30) produit une onde de flux magnétique mobile qui se déplace dans la direction latérale dans la zone d'activation des rouleaux (32) ;
les rouleaux (14) comprennent un matériau électriquement conducteur dans lequel des courants de Foucault sont induits par l'onde de flux magnétique mobile lorsque les rouleaux (14) passent à travers la zone d'activation des rouleaux (32), les courants de Foucault produisant un champ électromagnétique de réaction qui interagit avec l'onde de flux magnétique mobile pour produire un couple dans les rouleaux (14) qui fait tourner les rouleaux (14) dans la direction latérale (20) ;
le couple est suffisamment constant pour provoquer l'accélération de la zone d'activation des rouleaux (32) avec une accélération angulaire suffisamment constante pour déplacer les objets (B) transportés sur la bande parallèlement à la direction latérale (20) ; et
les accélérations latérales et les déplacements des objets transportés (B) sont inversement proportionnels au poids des objets transportés.

11. Convoyeur selon la revendication 1, dans lequel les rouleaux (14) tournent dans la direction latérale (20) à une vitesse constante à la sortie de la zone d'actionnement des rouleaux (32).

12. Procédé de transport d'objets (B), comprenant les étapes consistant à : transporter des objets (B) audessus de rouleaux (14) sur une bande transporteuse (12)
avancer dans une direction de déplacement de la bande (18) ; activer les rouleaux (14) passant à travers une zone d'activation des rouleaux (32) par induction linéaire pour les faire tourner dans une direction (20) transversale à la direction de déplacement de la bande (18) afin d'amener chaque objet (B) à se déplacer le long d'une trajectoire qui dépend du poids de l'objet vers un convoyeur latéral (36) situé sur un côté de la bande transporteuse (12) ; et empêcher les objets (B) de sortir du côté de la bande transporteuse (12) immédiatement en aval du convoyeur latéral (36) à l'aide d'un rail latéral (40).

13. Procédé selon la revendication 12 comprenant en outre la détermination du poids de chaque objet à partir de sa trajectoire.

14. Procédé selon la revendication 12 comprenant en outre le triage des objets d'un côté de la bande transporteuse en fonction de leur poids, les objets plus légers étant triés en amont des objets plus lourds.

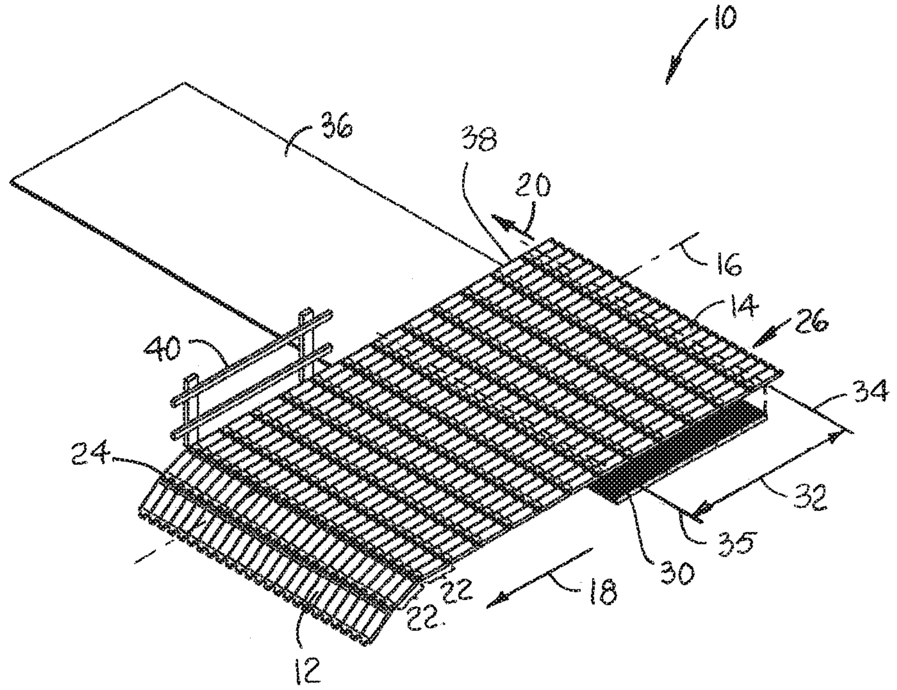

FIG. 1

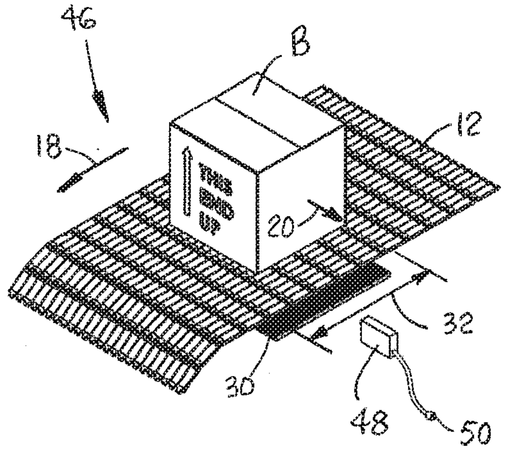

FIG. 6A

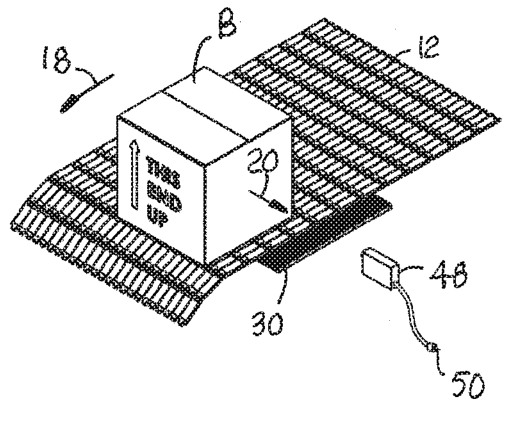

FIG. 6B

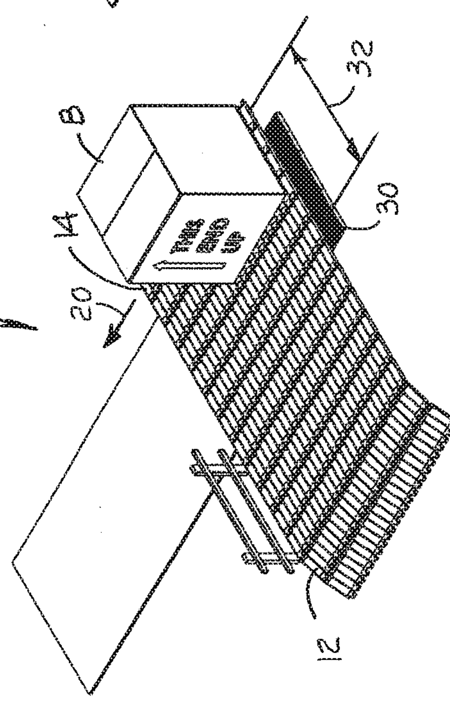

FIG. 2A

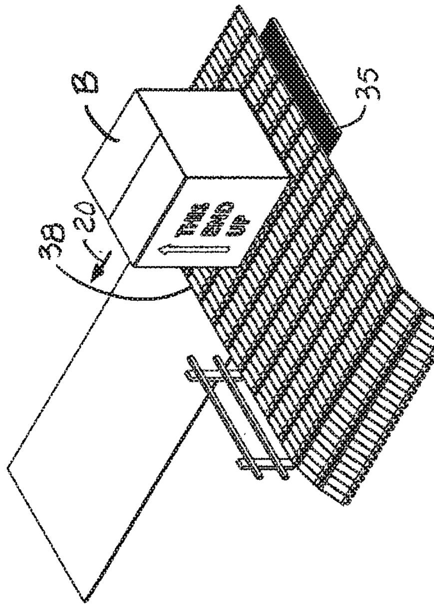

FIG. 2B

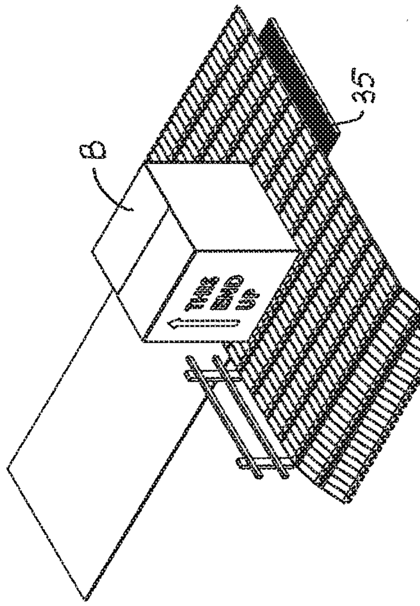

FIG. 2C

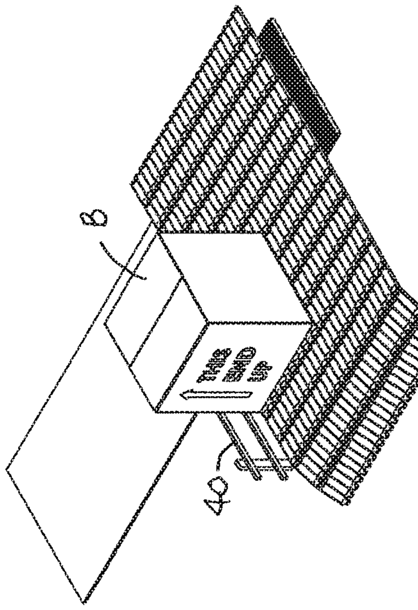

FIG. 2D

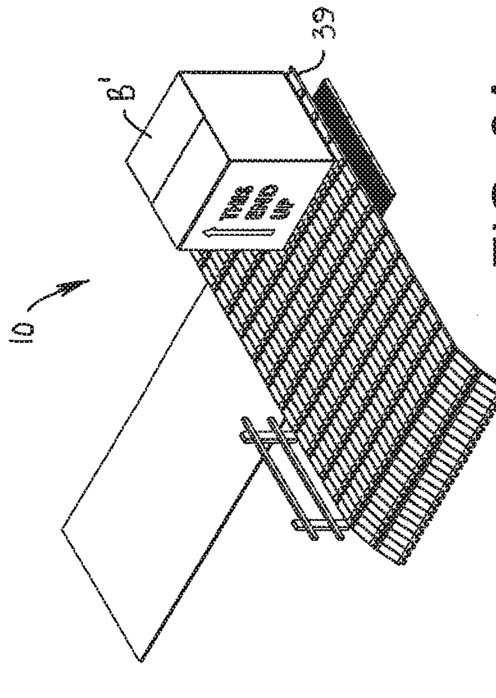

FIG. 3A

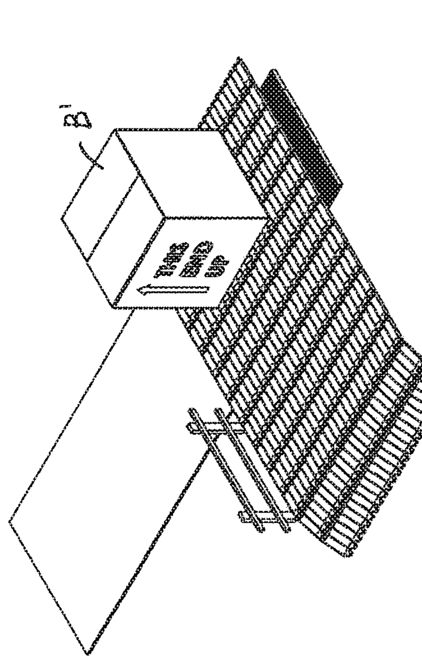

FIG. 3B

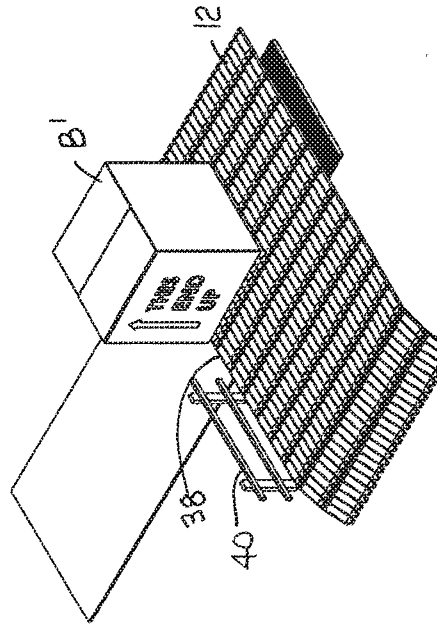

FIG. 3C

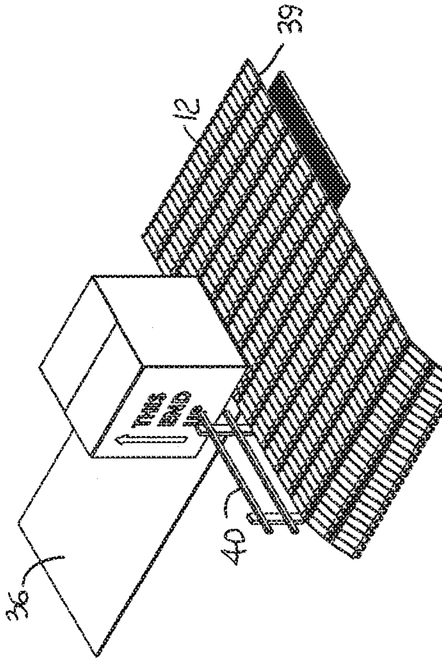

FIG. 3D

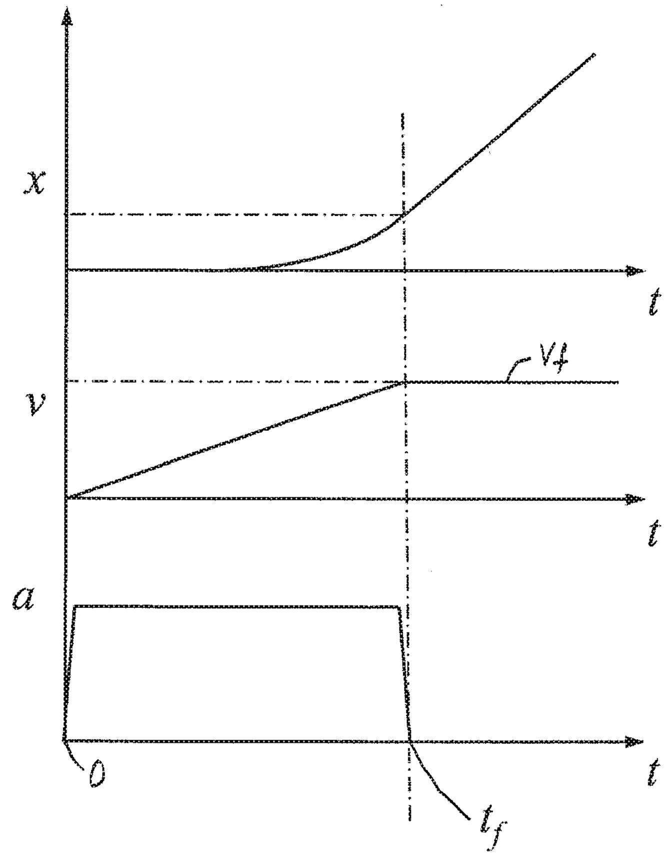

FIG. 4

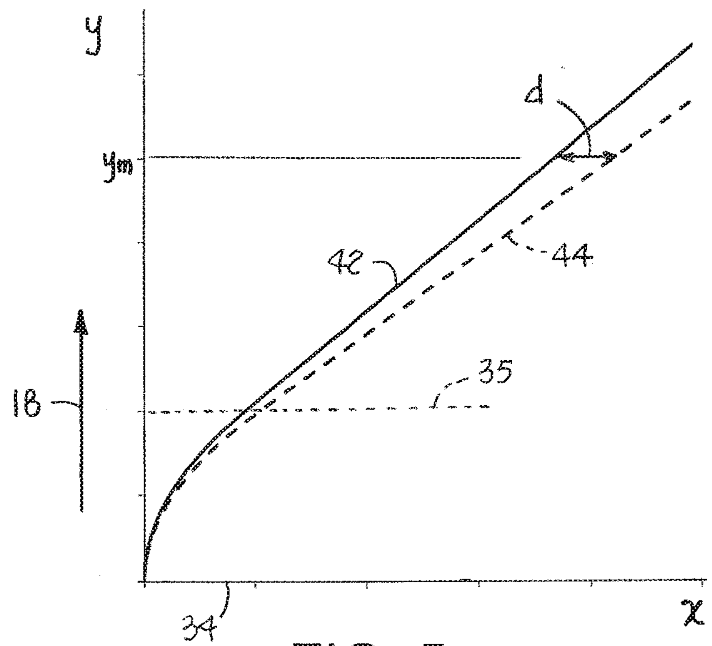

FIG. 5

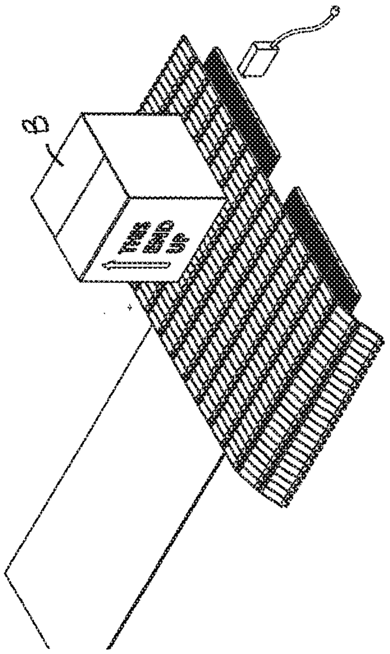

FIG. 7B

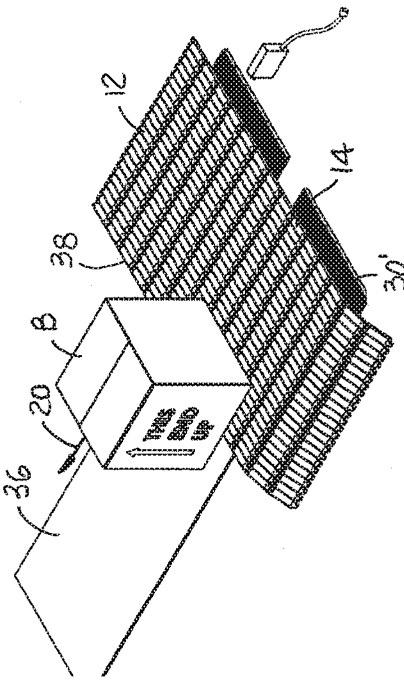

FIG. 7D

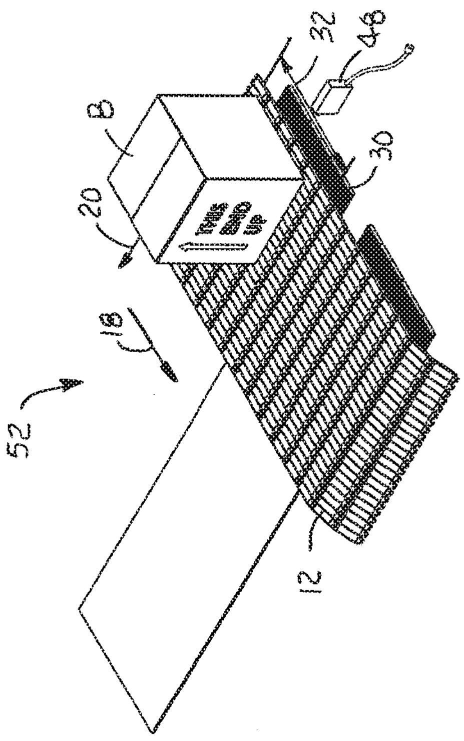

FIG. 7A

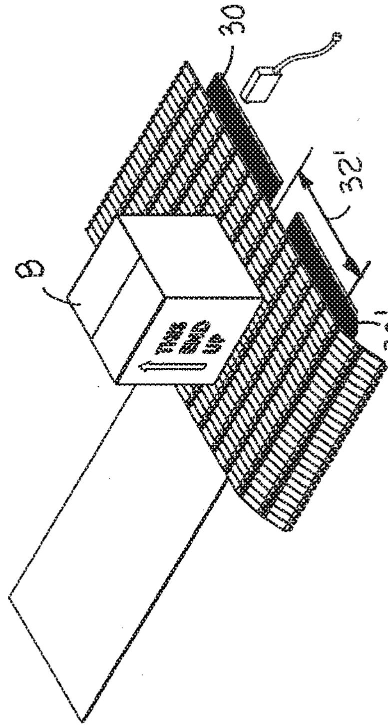

FIG. 7C

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2013169343 A **[0003]**